

1. EXECUTIVE SUMMARY

The consortium consisting of Focus, Mott Macdonald PDNA, MHP GeoSpace and Sivuno Consulting were appointed to undertake the Universal Access Plan (UAP) for water in the Amajuba, Ugu, Umkhanyakude, Utukela and Zululand District Municipalities in KwaZulu- Natal. The report was to focus on the following:

- Assessment of water planning status quo.
- Identify existing water supply schemes.
- Identify already proposed future water supply schemes (at a conceptual level).
- Existing and proposed water supply and demand options.
- An updated geo database.
- Preparation of a Universal Access Plan (UAP) which entails collection of infrastructure backlog, verification of existing data from the various municipalities and formulating a plan with relevant milestones and associated costs to achieve Universal Access.

The following documents were viewed for information regarding the water planning status quo and assessment of all existing supply schemes as well as proposed future supply options for each of the Local Municipalities and the District Municipalities:

Documents	Latest Report
Amajuba District Municipality Integrated Development Plan	2013
Newcastle Local Municipality Integrated Development Plan	2013
Emadlageni Local Municipality Integrated Development Plan	2013
Dannhauser Local Municipality Integrated Development Plan	2013
Development of Water Reconciliation Strategy for all towns in the Eastern Region for Amajuba District Municipality	2011
Ugu District Municipality Integrated Development Plan	2013
Vulamehlo Local Municipality Integrated Development Plan	2013
Umdoni Local Municipality Integrated Development Plan	2013
Umzumbe Local Municipality Integrated Development Plan	2013
Umziwabantu Local Municipality Integrated Development Plan	2013
Ezingoleni Local Municipality Integrated Development Plan	2013
Hibiscus Coast Local Municipality Integrated Development Plan	2013
Ugu District Municipality Water Services Development Plan	2008
Development of Water Reconciliation Strategy for all towns in the Eastern Region for Ugu District Municipality	2011
Umkhanyakude District Municipality Integrated Development Plan	2013
Umhlabuyalingana Local Municipality Integrated Development Plan	2013
Jozini Local Municipality Integrated Development Plan	2013
The Big 5 False Bay Local Municipality Integrated Development Plan	2013
Hlabisa Local Municipality Integrated Development Plan	2013
Mtubatuba Local Municipality Integrated Development Plan	2013
Umkhanyakude Water Services Development Plan	2006
Development of Water Reconciliation Strategy for all towns in the Eastern Region for Umkhanyakude District Municipality	2011
Uthukela District Municipality Integrated Development Plan	2013
Okhahlamba Local Municipality Integrated Development Plan	2013

Emnambithi Local Municipality Integrated Development Plan	2013
Indaka Local Municipality Integrated Development Plan	2013
Imbabazane Local Municipality Integrated Development Plan	2013
Uthukela Water Services Development Plan	2007
Development of Water Reconciliation Strategy for all towns in the Eastern Region for Uthukela District Municipality	2011
Zululand District Municipality Integrated Development Plan	2014
Edumbe Local Municipality Integrated Development Plan	2014
Uphongolo Local Municipality Integrated Development Plan	2014
Abaqulusi Local Municipality Integrated Development Plan	2014
Nongoma Local Municipality Integrated Development Plan	2014
Ulundi Local Municipality Integrated Development Plan	2014
Zululand District Municipality Water Services Development Plan	2011
Development of Water Reconciliation Strategy for all towns in the Eastern Region for Zululand District Municipality	2011
Department of Water Affairs Priority Projects	2011

The methodology applied in the development of a Universal Access Plan for Water Services in various District Municipalities were as follows:-

- MM PDNA arranged meetings with the technical staff of the various District Municipalities in order to obtain GIS information and confirm the water backlog data, as well as confirm their existing and proposed schemes.
- MHP GeoSpace obtained Geographic Information System (GIS) spatial information from various sources, including the various District Municipalities and the Department of Water Affairs. All data has been stored in an ESRI ArcGIS 10.1 relational geodatabase, using a geographic co-ordinate system (decimal degrees). Metadata has been captured for all the data within the geodatabase. Domains or look-up tables have also been included to ensure consistency in data capture across all areas, and by all users.
- Draft water supply footprints were digitised off the latest colour aerial photography available from the Department of Rural Development and Land Reform. These were captured as polygons following settlement boundaries, and using existing water infrastructure where available. Settlement boundary datasets from the Department of Water Affairs and the Department of Rural Development and Land Reform, together with household points from Eskom (captured in 2011), were used as informants in this process. Outlying households were incorporated where possible but this was not always achievable in cases of isolated households that were located away from the more densely settled areas. In some cases these isolated households consisted of independent, privately owned farms which have their own local supply. These were excluded from the water supply footprint.
- A web mapping application was developed for the District, and served on the internet using ArcGIS Server, from the ESRI suite of GIS software products. This allowed users to view the data in their particular area, and where possible, to identify gaps in the data which could then be addressed by the project team. The engineering team had editing capabilities on this website and were able to identify and edit the attributes of any of the water supply footprints, to edit their shape if necessary, or to capture completely new water supply

footprints in any area. Often these consisted of Independent farm houses with their own local supply, which were excluded from the water supply footprint.

- GIS analysis was used to calculate the high and low household numbers, as well as the high and low population counts, for each of the water supply footprints. Statistics SA were consulted on the best method in which to do this, and their census data was used to calculate the average growth rate per annum between 2001 and 2011. This data was applied to calculate the population in 2014 for each polygon. The same growth rate was applied to the number of households, which was calculated from the Eskom 2011 household point data. The table below indicates the growth rate for the various District Municipalities.

Census Year	1996	2001	2011	% Growth from 1996 - 2001	% Growth from 2001 - 2011	% growth pa (1996 - 2001)	% growth pa (2001 - 2011)
Amajuba	410790	468036	499839	13.9	6.8	2.8	0.7
Ugu	641491	704030	722484	9.7	2.6	1.9	0.3
Umkhanyakude	503757	573341	625846	13.8	9.2	2.8	0.9
Uthukela	556550	657736	668848	18.2	2.0	3.6	0.2
Zululand	691055	780069	803575	12.9	3.0	2.6	0.3

- The levels of service (LOS) points, supplied by the Department of Water Affairs, were mapped along with the water supply footprints. These were used to indicate which households were currently supplied with water services, and those which were not yet serviced and needed schemes to be implemented. The water backlogs in the five district District Municipalities are presented in the table below.

Local Municipality	Backlogs (Households)
Amajuba	23914
Ugu	16540
Umkhanyakude	36439
Uthukela	1312
Zululand	44473

- The highest number of households for each water supply footprint (whether from 2011 or 2014) was used to calculate current, future and probable water demand requirements, measured in million m³ per annum.
- Map series at a scale of 1:20 000 were printed of the entire District Municipality, and these were given to MM PDNA so that conceptual water supply schemes could be designed. These designs were then returned to the GIS team, and captured into the geodatabase.
- Once the concept plans had been captured, they were checked for connectivity between adjacent municipalities. Attribute data, where available, was added to the geodatabase.

- Ownership information was added to each footprint polygon, using cadastral from the Surveyor-General and ownership data from the Deeds office. As the polygons did not follow cadastral boundaries, but rather the actual settlement points, the centroid of each footprint was used to determine the ownership of the property at that location. Ownership was divided into private, non-private (which included national, provincial and local municipal ownership) and land owned by the Ingonyama Trust Board.
- Each water supply footprint was checked against existing water infrastructure data to determine whether there was, or was not, short term water supply in the area.

LOCAL MUNICIPALITY	NO OF WATER SUPPLY FOOTPRINTS	NO OF WATER SUPPLY FOOTPRINTS WITH SHORT TERM SUPPLY
Amajuba	289	266
Ugu	173	136
Umkhanyakude	3956	297
Uthukela	1312	564
Zululand	1477	836

- MM PDNA undertook the conceptual design based on the water supply footprints provided by MHP GeoSpace. Where possible the concept designs were tied into the various District Municipalities planned network to avoid any duplication of infrastructure and to reduce costs.

The following assumptions were made in undertaking the conceptual designs for the un-serviced population:

- Water consumptions were based in accordance to the table below:

Description of consumer category	Household Annual Income range	Per capita cons (l/c/d)		
		Min	Ave.	Max.
Very High Income; villas, large detached house, large luxury flats	>R1 228 000	320	410	500
Upper middle income: detached houses, large flats	153 601 – 1 228 000	240	295	350
Average Middle Income: 2 - 3 bedroom houses or flats with 1 or 2 WC, kitchen, and one bathroom, shower	38 401 – 153 600	180	228	275
Low middle Income: Small houses or flats with WC, one kitchen, one bathroom	9 601– 38 400	120	170	220
Low income: flatlets, bedsits with kitchen & bathroom, informal household	1- 9600	60	100	140
No income & informal supplies with yard connections		60	70	100
Informal with no formal connection		30	70	70
Informal below 25 l/c/d		0	70	70

- Each household has an average of 6 people
- Some of the existing boreholes are functional.

- The existing water reticulation schemes are operational.
 - Some of the existing water reticulation schemes have spare capacity.
 - Existing water treatment works have the potential to be upgraded or rehabilitated.
 - Schemes have some form of power supply.
 - General pipe size range is from 25 mm to 150 mm diameter.
 - Peak factor - 1.5
 - Water losses were considered to be 35%
 - Where there is an existing bulk line, connections to the bulk were kept to a minimum
 - Reticulation mains were placed in the road reserve for maintenance purposes.
 - District and provincial road crossings were kept to a minimum
- In viewing the water supply footprints on the GIS mapping the following parameters were used by MM PDNA to determine the type of scheme applicable to the different water supply footprints. The following scheme types were considered in the conceptual designs:
- Tie into existing schemes
 - Existing boreholes and standpipes that are non-functional to be rehabilitated.
 - Existing boreholes with reticulation to be rehabilitated.
 - Boreholes mechanically operated for settlements with a low population.
 - Boreholes electronically operated for settlements with a high population.
 - Package Plants for settlements which are densely populated.
 - From existing scheme pumped to new reservoir and reticulated.

Schematics and a detailed description of the various scheme types indicated above are indicated later in this document.

- The conceptual designs were quantified according to scheme types and the rates for various components of the water reticulation were provided by Umgeni Water and are stated in the document. The detailed costs for each scheme type are indicated in section 8.5 of this document.

The following table is a summary of the total cost estimates for the various scheme types for each of the District municipalities.

Amajuba DM	
Scheme Type	Total
Link to Existing Scheme	R 485 290 897
Small Package Plants	R 95 307 226
Boreholes electronically operated with Storage	R 25 013 994
New boreholes electronically operated	R 321 409 971
TOTAL	R 927 022 088

Ugu DM	
Scheme Type	Total
Link to Existing Scheme	R 1 387 994 240
New boreholes mechanically operated	R 5 881 260
New boreholes electronically operated	R 22 107 890
TOTAL	R 1 415 983 390

Umkhanyakude DM	
Scheme Type	Total
Link to Existing Scheme	R 4 371 648 927
Small Package Plants	R 1 222 765 458
Existing boreholes electronically operated	R 577 788
Existing boreholes electronically operated with Storage	R 20 045 907
New boreholes electronically operated	R 148 385 644
TOTAL	R 5 763 423 725

uThukela DM	
Scheme Type	Total
Link to existing scheme	R 3 087 950 153
Link to Existing Scheme operated with Storage	R 861 607 786
Small Package Plants	R 316 799 185
Existing boreholes electronically operated	R 6 578 675
Existing boreholes electronically operated with Storage	R 79 515 407
New boreholes mechanically operated	R 23 525 040
New boreholes electronically operated	R 592 822 483
TOTAL	R 4 968 798 729

Zululand DM	
Scheme Type	Total
Link to existing scheme	R 3 623 919 758
Package Plants	R 107 057 651
Existing boreholes electronically operated	R 410 944 538
Boreholes electronically operated with storage	R 136 343 195
New boreholes mechanically operated	R 126 447 090
New boreholes electronically operated	R 393 005 747
TOTAL	R 4 797 717 979

- The table below indicates the backlogs in the various District Municipalities and the cost per capita to eradicate the current backlog.

Local Municipality	Backlogs (Households)	Cost per capita
Amajuba	23914	R 6 461
Ugu	16540	R 14 268
Umkhanyakude	36439	R 24 724
uThukela	96 113	R 9 631
Zululand	44473	R 17 980

- The phasing of schemes is based on the proposed plans which cover all reticulation and bulk supplies to address the water backlogs. Potential funding such as Municipal Infrastructure Grant (MIG), Provincial Infrastructure Grant (PIG), Cooperative Governance and Traditional Affairs (COGTA), Department of Water Affairs and Forestry (DWA) etc may be applied for to undertake these projects. The table below indicates the phasing.

An average cost for each scheme type was compared with the cost estimate for an individual scheme. If the scheme was less than or equal to the average it was assumed that the project could be undertaken over a year. If the cost ratio was higher than the average cost, the ratio was used to determine the duration of the project. However, this is flexible depending on the nature and type of project.

Implementation Year	LM	Total Cost
2015/16	Amajuba	R 502 753 474
	Ugu	R 639 724 277
	Umkhanyakude	R 678 186 107
	Uthukela	R 3 125 691 589
	Zululand	R 2 870 624 139
		R 7 816 979 586

Implementation Year	LM	Total Cost
2016/17	Amajuba	R 120 745 147
	Ugu	R 513 995 056
	Umkhanyakude	R 83 176 578
	Uthukela	R 178 488 735
	Zululand	R 617 317 418
		R 1 513 722 934

Implementation Year	LM	Total Cost
2017/18	Amajuba	R 158 343 107
	Ugu	R 175 060 652
	Umkhanyakude	R 147 332 841
	Uthukela	R 455 919 171
	Zululand	R 527 986 683
		R 1 464 642 454

Implementation Year	LM	Total Cost
2018/19	Amajuba	R 145 180 360
	Ugu	R 87 203 404
	Umkhanyakude	R 1 125 479 076
	Uthukela	R 1 794 106 441
	Zululand	R 790 239 585
		R 3 942 208 866

- It is estimated that the existing water backlog of **12267** households within the 5 District Municipalities households can be eradicated by **2019** at a cost of **R 17 872 945 911** to develop **1093** schemes.
- All GIS data, including all current infrastructure, together with proposed schemes and the costs thereof have been incorporated into a structured geodatabase, with all relevant metadata. In some cases, metadata has also been captured for individual fields within particular datasets.

2. CONCLUSION AND RECOMMENDATIONS

2.1 Total cost of proposed schemes in the Zululand District Municipality

The following table gives an indication in the form of a summary of the proposed conceptual scheme types and the associated costs which need to be undertaken to alleviate the current water backlog of 12267 households in the 5 District Municipalities.

Amajuba DM	
Scheme Type	Total
Link to Existing Scheme	R 485 290 897
Small Package Plants	R 95 307 226
Boreholes electronically operated with Storage	R 25 013 994
New boreholes electronically operated	R 321 409 971
TOTAL	R 927 022 088

Ugu DM	
Scheme Type	Total
Link to Existing Scheme	R 1 387 994 240
New boreholes mechanically operated	R 5 881 260
New boreholes electronically operated	R 22 107 890
TOTAL	R 1 415 983 390

Umkhanyakude DM	
Scheme Type	Total
Link to Existing Scheme	R 4 371 648 927
Small Package Plants	R 1 222 765 458
Existing boreholes electronically operated	R 577 788
Existing boreholes electronically operated with Storage	R 20 045 907
New boreholes electronically operated	R 148 385 644
TOTAL	R 5 763 423 725

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Scheme Type	Total
Link to existing scheme	R 3 087 950 153
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Existing boreholes electronically operated	R 6 578 675
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TOTAL	R 4 968 798 729

Zululand DM	
Scheme Type	Total
Link to existing scheme	R 3 623 919 758
Package Plants	R 107 057 651
Existing boreholes electronically operated	R 410 944 538
Boreholes electronically operated with storage	R 136 343 195
New boreholes mechanically operated	R 126 447 090
New boreholes electronically operated	R 393 005 747
TOTAL	R 4 797 717 979

2.2 Total cost of phases of schemes

An average cost for each scheme type was compared with the cost estimate for an individual scheme. If the scheme was less than or equal to the average it was assumed that the project could be undertaken over a year. If the cost ratio was higher than the average cost, the ratio was used to determine the duration of the project. However, this is flexible depending on the nature and type of project. A detailed description of the phasing can be viewed in section 8.6 of the report.

The proposed conceptual design schemes may be phased according to the tables below.

Implementation Year	LM	Total Cost
2015/16	Amajuba	R 502 753 474
	Ugu	R 639 724 277
	Umkhanyakude	R 678 186 107
	Uthukela	R 3 125 691 589
	Zululand	R 2 870 624 139
		R 7 816 979 586

Implementation Year	LM	Total Cost
2016/17	Amajuba	R 120 745 147
	Ugu	R 513 995 056
	Umkhanyakude	R 83 176 578
	Uthukela	R 178 488 735
	Zululand	R 617 317 418
		R 1 513 722 934

Implementation Year	LM	Total Cost
2017/18	Amajuba	R 158 343 107
	Ugu	R 175 060 652
	Umkhanyakude	R 147 332 841
	Uthukela	R 455 919 171
	Zululand	R 527 986 683
		R 1 464 642 454

Implementation Year	LM	Total Cost
2018/19	Amajuba	R 145 180 360
	Ugu	R 87 203 404
	Umkhanyakude	R 1 125 479 076
	Uthukela	R 1 794 106 441
	Zululand	R 790 239 585
		R 3 942 208 866

2.3 Proposed Future Work

It is recommended that the concept designs covered in this report be advanced to preliminary designs.

It is recommended that the link to existing schemes for the various local municipalities be undertaken first due to the existing water treatment and bulk infrastructure. The table below is a summary of the cost of the link to existing schemes that can be undertaken.

Link to existing schemes	
District Municipality	Total
Amajuba	R 485 290 897
Ugu	R 1 387 994 240
Umkhanyakude	R 4 371 648 927
Uthukela	R 4 534 965 147
Zululand	R 3 453 738 255
Total	R 4 371 648 927